Saskatchewan
Agriculture
and Food

Final Report

Agriculture Research Branch
Saskatchewan Agriculture and Food

CONDUCT A SURVEY OF SQUIRREL AND POCKET GOPHER POPULATIONS AND PROBLEMS IN SASKATCHEWAN

20000203

October 2001

102-01388/

2001 SASKATCHEWAN "GOPHER" SURVEY

REPORT OF SURVEY RESULTS TO:

Provincial Council of ADD Boards

Saskatchewan Agriculture & Food

Field Survey Planned and Conducted by
Provincial Council of ADD Boards &
Sustainable Production Branch, SAF

Consulting, Data Entry and Analysis by
Sample Survey Unit, SAF

EXECUTIVE SUMMARY

Frequency and Distribution of Saskatchewan Farms Affected

- More than four out of five farmers (82%) reported having "gopher" problems.
- About one in five (19%) have problems with only pocket gophers.
- One quarter (25%) said they have problems with only ground squirrels.
- More than a third (37%) said they had problems with both types of gophers.
- Thus, it is estimated that more than half (57%) of Saskatchewan farmers have problems with pocket gophers and more than three out of five (63%) have problems with ground squirrels.
- Almost all Rural Municipalities were surveyed (97%).
- In almost half (44%) of RMs surveyed, all farmers reported having gopher problems.
- In more than nine out of ten RMs (92%) at least half of those surveyed reported gopher problems.
- In only two RMs (1%) did all of those surveyed report having no gopher problems.

Acres Affected by Pocket Gophers – Provincial Level

- Survey results suggest that about 8% of pasture land, about 15% of forage land, and about 4% of annual crop land in Saskatchewan are affected by pocket gophers.
- When applied on a weighted basis (1996 Census) across the Saskatchewan land base, these figures suggest that pocket gophers affect about 5% of all Saskatchewan farm land.
- This percentage of total farm land represents about 3.4 million acres.

Acres Affected by Ground Squirrels – Provincial Level

- Survey results suggest about 14% of pasture land, about 9% of forage land, and about 7% of annual crop land in Saskatchewan are affected by ground squirrels.
- When applied on a weighted basis (1996 Census) across the Saskatchewan land base, these figures suggest that ground squirrels affect about 9% of Saskatchewan farm land.
- This percentage of total farm land represents about 5.4 million acres.

Recent Trend

- Four of five (80%) of those with pocket gophers said that the problem had increased in the last ten years.
- Two-thirds (67%) felt that their ground squirrel problem had increased over the last ten years.

Impact on Farm Operations Affected by "Gophers"

- Crop loss due to "gophers" was reported by nearly two-thirds (64%) of those with pocket gophers and by three-quarters (75%) of those with ground squirrels.
- Equipment wear and tear is a problem for more than four out of five (82%) of those with pocket gophers and for more than half (53%) of those with ground squirrels.
- Injury to livestock as a result of "gopher" burrows was reported by one in ten (10%) of those with pocket gophers and by one-quarter (25%) of those with ground squirrels.

Farmer Response to "Gopher" Problems

- Nearly half (48%) of those with pocket gopher problems said they attempt to manage the problem.
- More than nine out of ten farmers (92%) with ground squirrels said they try to manage the problem.
- Attempted control measures varied by gopher species. The most common control measures used for pocket gophers were poisoning (51%) and trapping (46%). For ground squirrels, shooting was the most common control measure (31%), followed by poisoning (69%).
- According to those surveyed, spring is the preferred season for control measures for both pocket gophers (67%) and ground squirrels (89%).
- A minority of farmers was satisfied with their control measures both for pocket gophers (25% completely/6% somewhat) and for ground squirrels (31% completely/8% somewhat).
- Less than half of farmers (42%) said they were aware of other control measures for pocket gophers. Less than one-third (32%) said they were aware of other control measures for ground squirrels.

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1. INTRODUCTION

1.1 Background

Considerable anecdotal evidence has been mounting in recent years about the increasing populations of "gophers" in rural Saskatchewan and producers have been expressing their growing concerns about the negative impact on their farm operations Farm organizations like the Saskatchewan Association of Rural Municipalities (SARM) have been requesting government action to deal with the situation. Media reports about the "gopher" infestations have become more frequent.

Saskatchewan Agriculture & Food (SAF) has been monitoring the problem and its Sustainable Production Branch, in particular, has taken a lead role in addressing the issues raised.

As well, the Provincial Council of ADD Boards (PCAB) has been gathering information about the "gopher" problem from members of its regionally distributed boards who have brought forward on-going reports of the apparent explosive growth in populations of both ground squirrels and pocket gophers. PCAB has brought this anecdotal information forward as part of its advisory role to provincial policy makers. In addition, PCAB has extensive experience with rodent problems, having administered the Pest Control Program for a number of years. As a result, PCAB has entered into an agreement with Saskatchewan Agriculture & Food to conduct a survey of the recent experience that Saskatchewan farmers have had with the "gopher" problem.

1.2 Purpose

- The primary purpose of the Gopher Survey is to gather information directly from Saskatchewan farmers in order to assess the scope and severity of the "gopher" problem. It is intended that the survey results will speak to verification of existing anecdotal information by providing useful measures of the geographical distribution of the gopher species across the province and the regional intensity of infestations
- The survey also seeks to establish what control measures producers are undertaking to address their problems and what their success has been, as well as what other control measures are known to them.
- Additional information gathered by the survey may provide some insight into environmental factors and farm practices that could be related to rising "gopher" populations.

1.3 Methodology

1.3.1 Definition of "Gophers"

The two types of "gophers" under scrutiny in the survey are pocket gophers and Richardson ground squirrels. The name "gophers" is usually used to refer (incorrectly) to a type of rodent called ground squirrels, typically the Richardson ground squirrel species that is common to the Prairie landscape. The name "mole" is usually used (incorrectly) to refer to pocket gophers. Thus, in common parlance, the term "gopher" is usually incorrect when applied, and usually not applied when it would be correct.

Apart from the peculiarities of the Prairie vernacular, the term "gopher" did present methodological problems for the survey. Since the survey needs to account for the differing distributions and impact of each type of rodent, articulating the difference to respondents was important. This was especially true for surveying the farm population where the common use of the term is not the same as the technical one.

The challenge in the field phase of the survey was to ensure that farmers were providing feedback on the correct type of rodent when questions were being asked. In an attempt to provide clarity among

respondents, those coordinating the survey field work thoroughly instructed telephone interviewers to explain the difference between the gopher types and to focus on the correct type when asking questions.

Despite the scrupulous efforts made to maintain clarity, some 'cross talk' may have occurred during interviewing, where some responses may not have been strictly focused on the correct species when given. The first section of the survey may have been prone to this because it dealt with pocket **gophers**. The use at the outset of the survey of the term "gopher", and the common association of the term with ground squirrels, could have produced an upward bias in reporting the severity of pocket gopher infestations.

Analysis of the data shows that reported pocket gopher problems are very consistent with known habitat patterns, both geographically and by type of land use. There does not appear to be confusion over the prevalence of pocket gophers and, thus, any over-estimation of pocket gopher severity is very likely to be slight. Where 'cross talk' may have had an impact on results is in reports of 'total acres affected by pocket gophers', where data analysis shows that some respondents may have included the common "gopher" (ground squirrels) in estimating the extent of their **pocket** gopher infestation, i.e. thinking the question meant **all** "gophers". This measure of total acres affected by pocket gophers is not reported; rather, total acres affected are estimated from the reported pocket gopher severity for each land use type.

The term gopher has appeared in quotation marks until this point of the report to emphasize its ubiquitous use to refer to both types of rodents. The quotation marks will now be dropped so, as the report proceeds, gopher will be used to refer to both types of rodents (even though the usage is technically incorrect) to avoid the need to write out both species names.

1.3.2 Sampling

In order to assess both the breadth and intensity of gopher infestations in the province, complete geographical coverage of the province was required, a need which guided decisions about sampling. The small, but inherently real, probability of selecting a sample that was not geographically representative dictated a reassessment of the typical simple random sample approach that could have been utilized. Furthermore, the ADD Boards network, from which telephone interviewers could be recruited, blankets the entire province and is composed of board members with extensive local knowledge. This provided PCAB with a unique opportunity to ensure geographical representativeness in the sample and, at the same time, to achieve administrative and cost efficiencies by eliminating the onerous task of preparing sample frames at the level of each rural municipality (RM).

As a result, a decision was made to attempt to sample from every RM in the province and to utilize local telephone interviewers who would select a sample within each RM. Instructions were given to interviewers to select farmers who were well distributed geographically throughout the RM. They could be selected from a municipal map or be farmers known to the interviewers. Apart from geographical distribution, no other characteristics were instructed to be used a selection criteria, in order to reduce biases in the sample. Additional instructions were given during field work to avoid selecting only those farmers known to have gophers. Six interviews were to be completed in each RM.

The non-probability nature of the sampling within RMs undermines the strict theoretical assumptions about random selection that underpin the making of parametric estimates. However, this is offset by the thorough geographical coverage of the province and large sample size achieved in the survey. It is unlikely that any biases were introduced into the survey through the chosen sampling technique which would adversely affect the results, except for the possibility that some interviewers may have tended to select farmers who were known to have gopher problems.

While such a potential selection bias could result in over-estimation of the extent of the gopher problem, there is countervailing evidence from the survey to suggest that over-reporting of gopher problems by crop type did not occur. In addition to providing estimates of the percentage of affected acres individually for pasture, forage, and annual crops, farmers were asked what percentage of their **total** land was affected by each type of rodent, a measure which is not included in this report (see notes above). The average percentage of **total** land affected actually exceeded the provincial-level measures calculated from the separate reports for pasture, forage, and crop land that **are** included in the report (Sections 2.2.3 and 2.3.3).

Since there is some evidence that the extent of gopher problems may actually be higher than this report states, on balance, estimates of the extent and intensity of gopher problems made from the survey results reported here are very likely to be representative of the province.

1.3.3 Data Gathering and Analysis

Telephone interviews were completed with 1,731 Saskatchewan land owners (virtually all farmers), during January and February of 2001. The survey gathered information from 288 (97%) of a total of 297 RMs. Field work was jointly coordinated by Sustainable Branch of SAF and PCAB.

The survey data were entered, cleaned, and analyzed by the Sample Survey Unit, Statistics Branch of SAF, using SPSS and Excel computer software. Maps were prepared by the Geomatics Unit, Statistics Branch of SAF, utilizing the latest in GIS software.

2. SURVEY RESULTS

2.1 Survey Introduction

The introductory section of the survey gathered information on several demographic variables and determined whether farmers had a gopher problem and with which species.

2.1.1 Demographics

As summarize in Figure 1, the sample was well distributed throughout the province. Comparison to the 1996 Census distribution of number of farms per Crop District revealed that the sample distribution is not significantly different from the Census distribution (Chi-square=4.759, d.f.=19).

FIGURE 1: DISTRIBUTION OF SAMPLE BY CROP DISTRICT

Crop District	1A	1B	2A	2B	3AN	3AS	3BN	3BS	4A	4B	5A	5B	6A	6B	7A	7B	8A	8B	9A	9B
% of Sample	5.4	4.9	3.9	4.9	4.2	5.8	4.9	4.2	2.5	3.1	7.3	8.4	6.8	5.5	4.5	3.6	4.1	4.3	6.9	5.0

When RM locations are converted into an approximation of soil zones, the sample distribution is also well distributed.

FIGURE 2: DISTRIBUTION OF SAMPLE BY SOIL ZONE

Soil Zone	Percent of Sample
Brown	27.5
Dark Brown	26.5
Black	30.7
Dark Gray	15.3
Total	100.0

The average amount of land operated in the survey is 2,106 acres. The sample distribution by acres operated is shown in Figure 3.

FIGURE 3: SAMPLE DISTRIBUTION BY TOTAL ACRES OPERATED

Total Acres Operated	Percent of Sample
< 641	14.1
641 - 1,280	24.7
1,281 - 1,920	20.1
1,921 - 4,000	32.4
> 4,000	8.7
Total	100.0

The surveyed gathered some information on farming practices that may be related to gopher problems.

- Three-quarters (75%) of farmers surveyed were involved in forage or livestock production.
- More than half (54%) of those surveyed practice continuous cropping.

The prevalence of gopher problems was very wide.

- More than four out of five farmers (82%) reported having gopher problems.
- About one in five (19%) reported having problems only with pocket gophers.
- About one-quarter (25%) reported having problems only with ground squirrels.
- More than one-third (37%) reported having problems with both types of rodents.
- Thus, it is estimated that more than half (56%) of Saskatchewan farmers have problems with pocket gophers and that more than three out of five (62%) have problems with ground squirrels.

2.1.2 Geographical Coverage

The survey covered virtually every corner of the province. Nearly all (97%) of the 297 RMs in Saskatchewan were surveyed. The average number of farmers surveyed in each RM was 6.01.

Figure 4 shows the distribution of RMs according to the frequency of gopher problems experienced. Of the 288 surveyed, a preponderance of gopher problems was reported.

- In only two (1%) of the RMs did **none** of those surveyed report having gopher problems.
- In more than nine out of ten RMs (92%), **at least half** of those surveyed reported gopher problems.
- In almost half (44%) of RMs **all** farmers reported having gopher problems.

FIGURE 4: DISTRIBUTION OF RMs BY PROPORTION OF FARMERS WITH GOPHER PROBLEMS

Proportion of respondents within the RM who have gopher problems	Percent of RMs with this proportion
0%	0.7
Up to 24%	1.0
25% to 49%	5.9
50% to 74%	20.1
75% to 99%	28.1
100%	44.1
Total	100.0

2.2 Pocket Gopher Section

2.2.1 Pocket Gopher Trend

Four out of five (80%) of farmers with pocket gopher said that the problem has increased over the last ten years.

2.2.2 Pocket Gopher Severity by Land Use

The pattern of the severity of pocket gopher infestations by land use that emerges from the survey is not unexpected, given this species' known habitat. The most severe infestations occur in forage land, followed by pasture land, with annual crop land clearly having the least problem with pocket gophers. Figure 5 shows the percentage of those with pocket gophers that fall into the differing severity categories.

FIGURE 5: POCKET GOPHERS INFESTATION SEVERITY (% REPORTING) BY LAND USE

	Pasture	Forage	Annual Crops
Light	50.1	18.8	78.5
Moderate	30.5	34.8	18.1
Severe	19.3	46.4	3.4

2.2.3 Area Affected by Pocket Gophers

The categories of infestation severity were quoted by interviewers with ranges of percent of land affected: Light = 0-10%; Moderate = 11-35%; and Severe = More than 35%. By assigning weight values based on these ranges to each category, provincial level estimates can be made of the percentage of each type of land and the percentage of all farm land that is affected by pocket gophers.

- Survey results suggest that about 8% of pasture land, about 15% of forage land, and about 4% of annual crop land in Saskatchewan are affected by pocket gophers.
- When applied on a weighted basis (1996 Census) across the Saskatchewan land base, these figures suggest that pocket gophers affect about 5% of Saskatchewan farm land.

2.2.4 Impact of Pocket Gophers on Farm Operations

The impact of pocket gopher infestations on farm operations is focused primarily in two areas – equipment damage (reported by 82% of farmers with pocket gophers) and crop loss, (64% reporting). Figure 6 summarizes the impact of pocket gophers. Within the 'Other' category (, "Rough ground" and "Loss of time" were the main problems experienced because of pocket gophers.

FIGURE 6: FREQUENCY OF IMPACT AMONG THOSE WITH POCKET GOPHERS

	% reporting
Equipment damage	82.1
Crop loss	64.1
Livestock injury	10.4
Other	7.8

2.2.5 Pocket Gopher Control

- Less than half (48%) of farmers with pocket gophers said they attempt to control them.
  - The most frequent control measure used was poisoning (51%), followed by trapping (46%).
  - Among the 'Other' control measures identified by (19% of) farmers with pocket gophers, the most common were leveling/harrowing, cultivation, and crop rotation.
- Two-thirds (67%) of farmers with pocket gophers said that spring was the best time for control, followed by summer (15%).
- Only one quarter (25%) of farmers were completely satisfied with the results of their pocket gopher control measures, while some (6%) were somewhat satisfied.
- About two out of five farmers (42%) said they were aware of other control measures for pocket gophers.

2.3 Ground Squirrel Section

2.3.1 Ground Squirrel Trend

Two-thirds (67%) of farmers with ground squirrels indicated they felt the problem had increased over the last ten years.

2.3.2 Ground Squirrel Severity by Land Use

As with pocket gophers, the pattern of the severity of infestations of ground squirrels by land use is consistent with the species' habitat. The most severe infestations occur in pasture land, followed by forage land, and then annual crop land. Figure 7 shows the percentage of those farmers with pocket gophers that fall into the differing severity categories.

FIGURE 7: GROUND SQUIRREL INFESTATION SEVERITY (% REPORTING) BY LAND USE

	Pasture	Forage	Annual Crops
Light	31.3	47.1	63.6
Moderate	35.4	34.0	25.0
Severe	33.3	18.9	11.4

2.3.3 Area Affected by Pocket Gophers

The categories of infestation severity were quoted by interviewers with ranges of percent of land affected: Light = 0-10%; Moderate = 11-35%; and Severe = More than 35%. By assigning weight values based on these ranges to each category, provincial level estimates can be made of the percentage of each type of land and the percentage of all farm land that is affected by ground squirrels.

- Survey results suggest that about 14% of pasture land, about 9% of forage land. and about 7% of annual crop land in Saskatchewan are affected by ground squirrels.
- When applied on a weighted basis (1996 Census) across the Saskatchewan land base, these figures suggest that ground squirrels affect about 9% of Saskatchewan farm land.

2.3.4 Impact of Ground Squirrels on Farm Operations

The most frequently reported impact of ground squirrels on farm operations was crop loss (75% of farmers with ground squirrels reporting). Equipment damage was also a major impact (53% reporting). Figure 8 summarizes the manifestation of ground squirrel infestations within the farm operation. Within the 'Other' impact category, 'Loss of time' and 'Rough ground' were the main problems experienced.

FIGURE 8: FREQUENCY OF IMPACT AMONG THOSE WITH GROUND SQUIRRELS

	% reporting
Crop loss	75.3
Equipment damage	53.2
Livestock injury	25.5
Other	6.4

2.3.5 Ground Squirrel Control

Most farmers with ground squirrels (92%) attempt to control them. Figure 9 shows the most frequently used methods of control.

FIGURE 9: CONTROL MEASURES USED FOR GROUND SQUIRRELS

	% reporting
Shooting	80.9
Poison	69.2
Trapping	11.2
Other	2.4

Most farmers (89%) reported spring as the best season for control.

Less than on-third (31%) of farmers were satisfied with their ground squirrel control efforts and some (8%) were somewhat satisfied.

Less than one-third (32%) of farmers with ground squirrels were aware of other control measures.

2.4. Environmental Factors

2.4.1 Geography

Geography plays an interesting role in determining whether or not farmers have problems with gophers. The sample was divided according to RM into three regions – south, central, and north. When analyzed, the geographical distribution (Figure 10) of those who reported having gopher problems (**both** kinds) is virtually the same as the distribution of those who did not have gopher problems. There is no statistically significant difference (Chi-square sig.=0.632).

Indeed, the relatively uniform pattern of experiencing problems with gophers appears to be much more localized. If there was significant variation in gopher problems across the province, then there ought to be a large number of localized areas, such as the twenty Crop Districts, that are statistically different from one another. But, investigation via Analysis of Variance reveals that 18 out of 20 Crop Districts form a statistically homogenous subset in relation to farmers having gopher problems – a high level of homogeneity. There is little difference in the frequency of gopher problems among Crop Districts.

This outcome is not particularly surprising and should be read for what it means. Because pocket gophers tend to occur in regions different from ground squirrels, the province is pretty much covered by one or the other. The impact on farm operations, however, is very significant since either species causes the kinds of farm level problems analyzed above. In other words, farmers everywhere in Saskatchewan are having "gopher" problems that manifest themselves in cost-creating ways such as lost crops, lost time, extra repairs, and injured livestock, not to mention the inconvenience.

At the same time, the differing geographical distribution between types of gophers is interesting and largely confirms known species habitat. The survey demonstrates that pocket gophers occur more frequently in central and northern areas (Figure 10) and ground squirrels frequent the south (Figure 10). (Further analysis, via Analysis of Variance, revealed that the differences in pocket gopher frequency between the three regions are all statistically significant. For ground squirrels, the south is statistically different from the central and northern regions, while the latter two are not statistically different.)

FIGURE 10: GOPHER PROBLEMS VS. NO GOPHER PROBLEMS BY REGION

	"Gopher" problems?	Pocket gophers problems?	Ground squirrels problems?

Region	Yes	No	Yes	No	Yes	No
South	43.4	43.9	30.7	60.4	51.0	31.0
Central	35.9	37.7	42.2	28.4	32.2	43.0
North	20.7	18.4	27.1	11.2	16.9	26.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

More insight into the geographical distribution of both types of gophers by drawing provincial maps of infestation levels by type of crop. Figures 13 – 18 at the end of the Survey Results section show how the level of infestation of each type varies across the province for pasture, forage and annual crops.

2.4.2 Soil Zones

Soil zone categories – Brown, Dark Brown, Black, and Dark Gray – were created from RMs. This exercise is somewhat imprecise because 'leakage' occurs between zones in those RMs that overlap more than one soil zone. Thus, survey results reported by soil zone should be used with caution.

Unlike geography, soil zone does appear to have a bearing on whether gopher problems exist (both kinds). The first and second columns of Figure 11 show that gopher problems are more frequently reported in the Black soil zone and less frequently reported in both the Dark Brown and Dark Gray zones. The relationship between gopher problems and soil zone is statistically significant (Chi-square sig.=0.000).

FIGURE 11: GOPHER PROBLEMS VS. NO GOPHER PROBLEMS BY SOIL ZONE

	"Gopher" problems?		Pocket gopher problems?		Ground squirrel problems?	
Soil Zone	Yes	No	Yes	No	Yes	No
Brown	27.5	27.4	14.4	44.7	33.7	17.0
Dark Brown	24.6	35.2	23.8	30.0	25.4	28.2
Black	33.5	18.1	42.7	15.0	32.0	28.6
Dark Gray	14.4	19.4	19.1	10.3	8.8	26.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

The patterns of occurrence by soil zone differ between gopher types (Figure 11, columns 3 through 6), reflecting variations in habitat according to soil zone. (Recalling the analysis by geography above, one can see, also, the underlying co-relationship between geography and soil zone.)

- Pocket gophers are much less likely to occur in the Brown and Dark Brown soil zones, but much more frequently appear in the Black and Dark Gray zones.
- Ground squirrels present a different picture. While ground squirrels are more likely to be reported in the Brown soil zone, they are also somewhat more frequent in the Black zone. As with pocket gophers, ground squirrels are less likely to be reported in the Dark Brown and Dark Gray soil zones.

It appears that pocket gophers are focused in the Black and Dark Gray soil zones and ground squirrels primarily focused in the Brown soil zone. This relationship is summarized in Figure 12 where the cross tabulation of type of gopher problem by soil zone reveals a statistically significant relationship between them (Chi-square sig.=0.000). Black and Dark Gray soil zones are home to the pocket gopher, while ground squirrels roam the Brown soil zone.

FIGURE 12: GOPHER TYPE BY SOIL ZONE

Gopher Types Reported			
Pocket gopher	Ground squirrel	Both	Total
% Reporting			

Brown	7.4	57.0	18.1	27.5
Dark Brown	21.7	26.3	24.8	24.6
Black	38.4	12.8	44.9	33.5
Dark Gray	32.4	3.9	12.2	14.4
Total	100.0	100.0	100.0	100.0

2.5 Farm Practice Factors

2.5.1 Land Use

As reported in Section 2.2.2, the most severe infestations occur in forage land, followed by pasture land, with annual crop land clearly having the least problem with pocket gophers. As with analysis by soil zone, there may be an underlying co-relation between land use and geography. Figures 13 to 18 provide some insight into the differing provincial patterns of each gopher type's infestation level for pasture, forage, and annual crop land.

2.5.2 Continuous Cropping

Farmers were asked if they practice continuous cropping. Those who practice continuous cropping and those that do not were compared as to the severity of gopher infestations in annual crops.

- For pocket gophers, the severity of the problem was greater for those who practice continuous cropping and the difference was statistically significant (t Sig.=0.001).
- For ground squirrels, the severity of the problem was also greater for those who practice continuous cropping and the difference, again, was statistically significant (t Sig.=0.031).

There is some evidence to suggest that the rise in continuous cropping is associated with the recent increase in gopher populations.

2.5.3 Methodological Note

Since there is likely significant auto-correlation between geography, soil zone, land use, and continuous cropping, the associations reported here should be taken at face value. Without further analysis, apportioning the correlation among these variables should be done with caution.

FIGURE 13:

Percent of Pasture Land Affected by Pocket Gophers

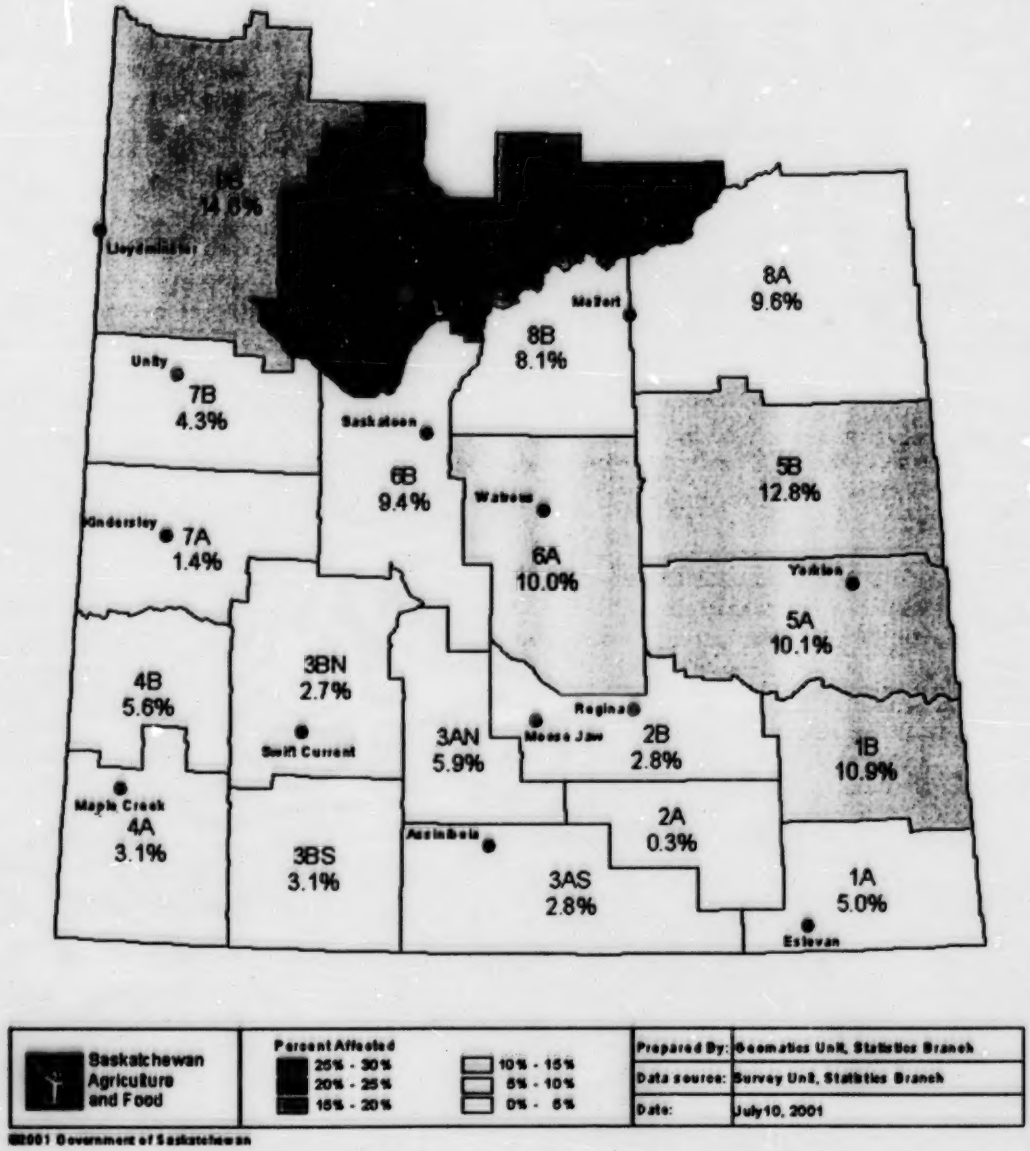
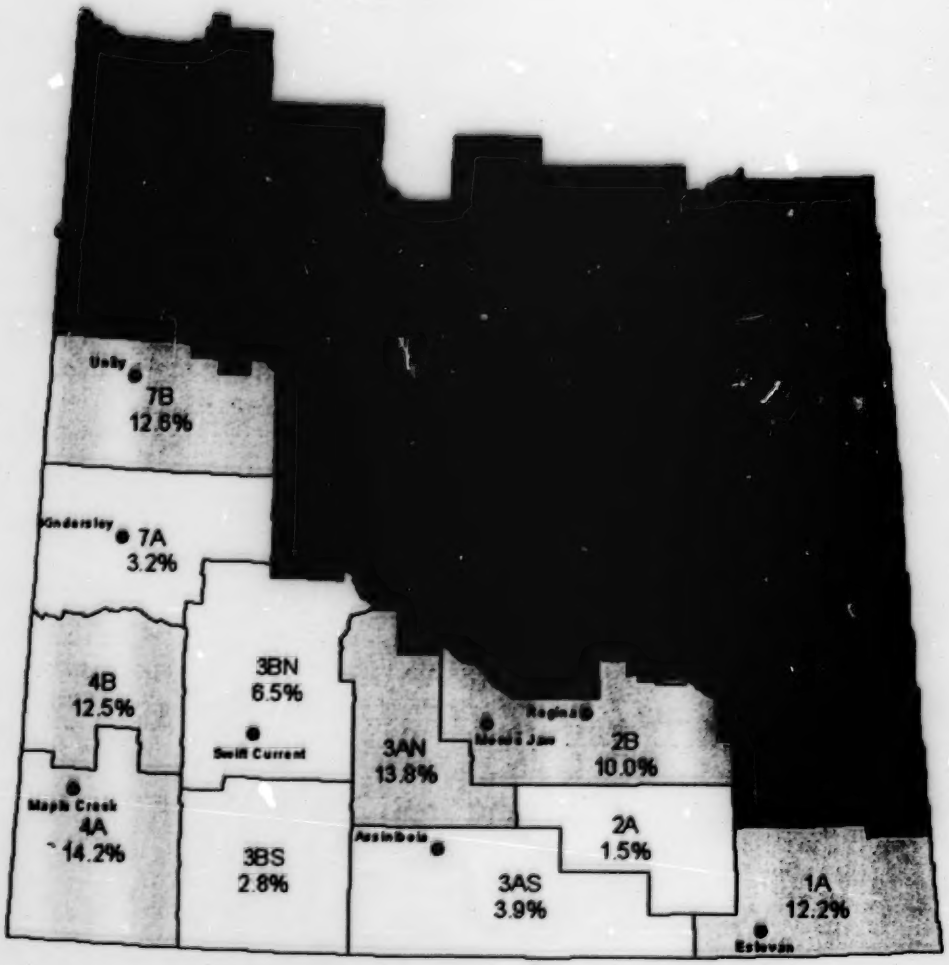


FIGURE 14:

Percent of Forage Land Affected by Pocket Gophers



Saskatchewan Agriculture and Food	Percent Affected: 25% - 30%; 20% - 25%; 15% - 20%; 10% - 15%; 5% - 10%; 0% - 5%	Prepared By:	Geomatics Unit, Statistics Branch
		Data source:	Survey Unit, Statistics Branch
		Date:	July 10, 2001

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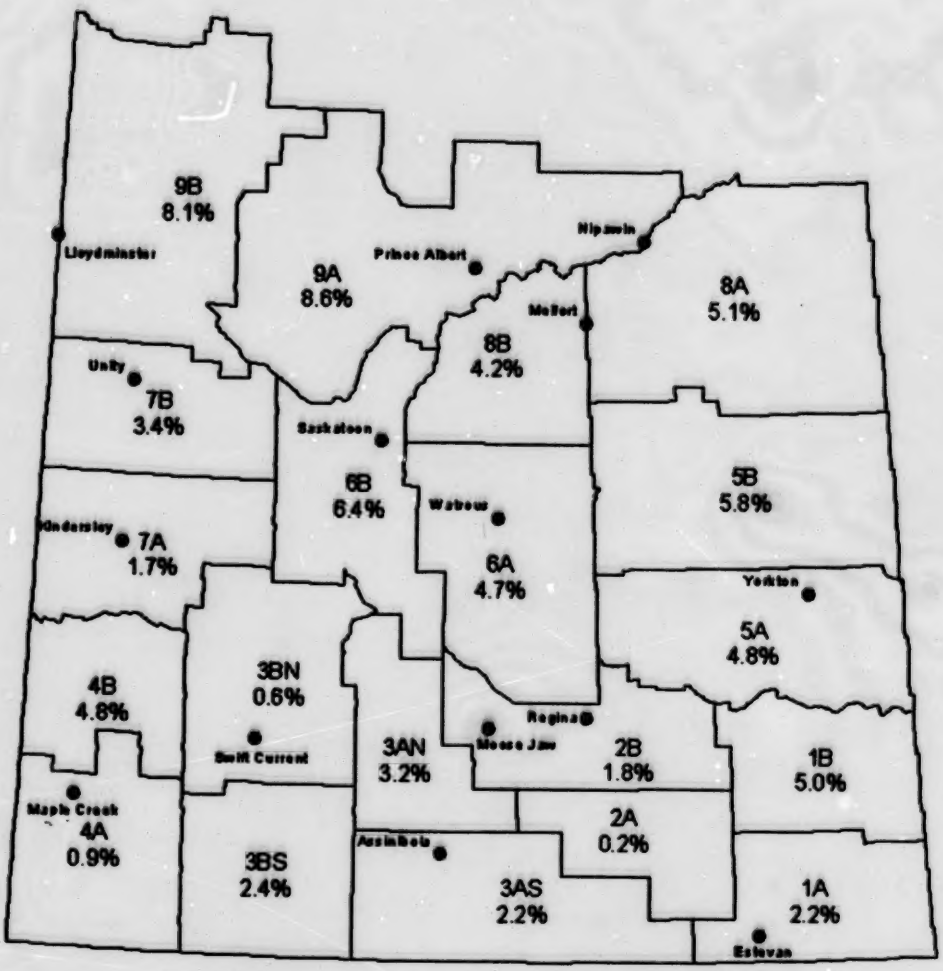
FIGURE 15:

Percent of Annual Crop Land Affected by Pocket Gophers



Saskatchewan Agriculture and Food	Percent Affected: 25% - 30%; 20% - 25%; 15% - 20%; 10% - 15%; 5% - 10%; 0% - 5%	Prepared By:	Geomatics Unit, Statistics Branch
		Data source:	Survey Unit, Statistics Branch
		Date:	July 10, 2001

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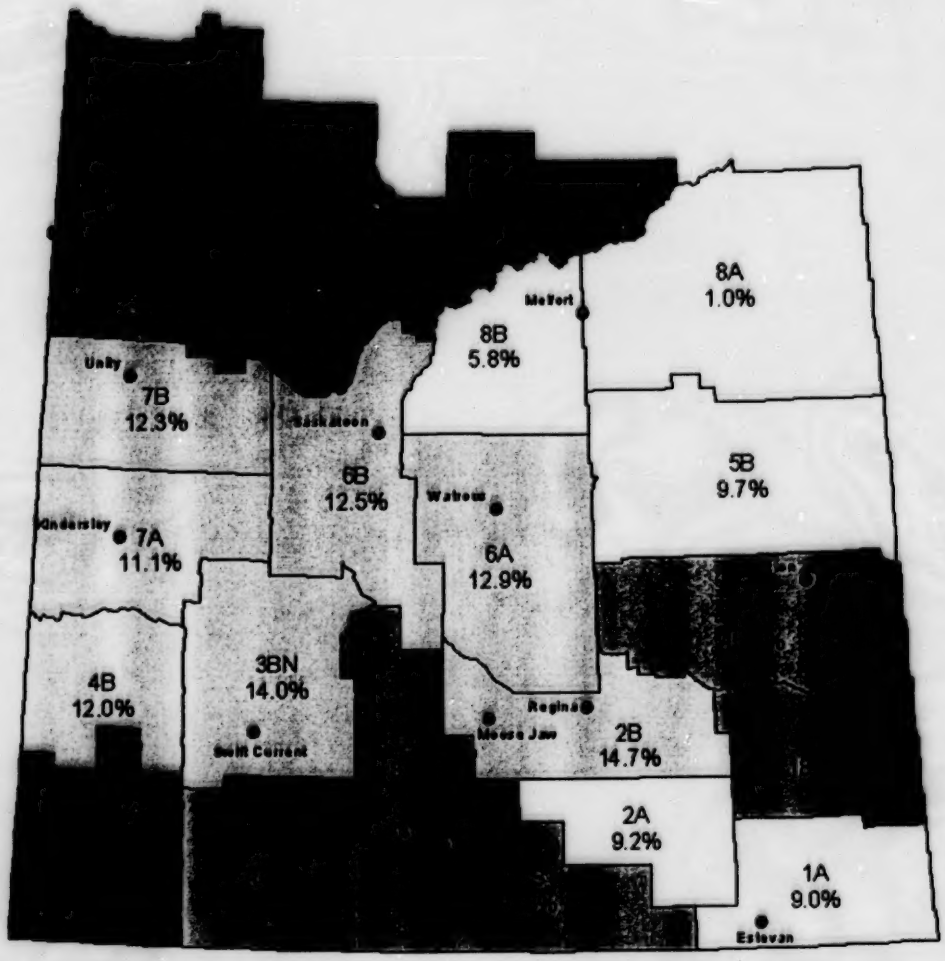
FIGURE 16:

Percent of Pasture Land Affected by Ground Squirrels



Saskatchewan Agriculture and Food	Percent Affected		Prepared By:	Geomatics Unit, Statistics Branch
	25% - 30%	10% - 15%	Data source:	Survey Unit, Statistics Branch
	20% - 25%	5% - 10%	Date:	July 10, 2001
	15% - 20%	0% - 5%		

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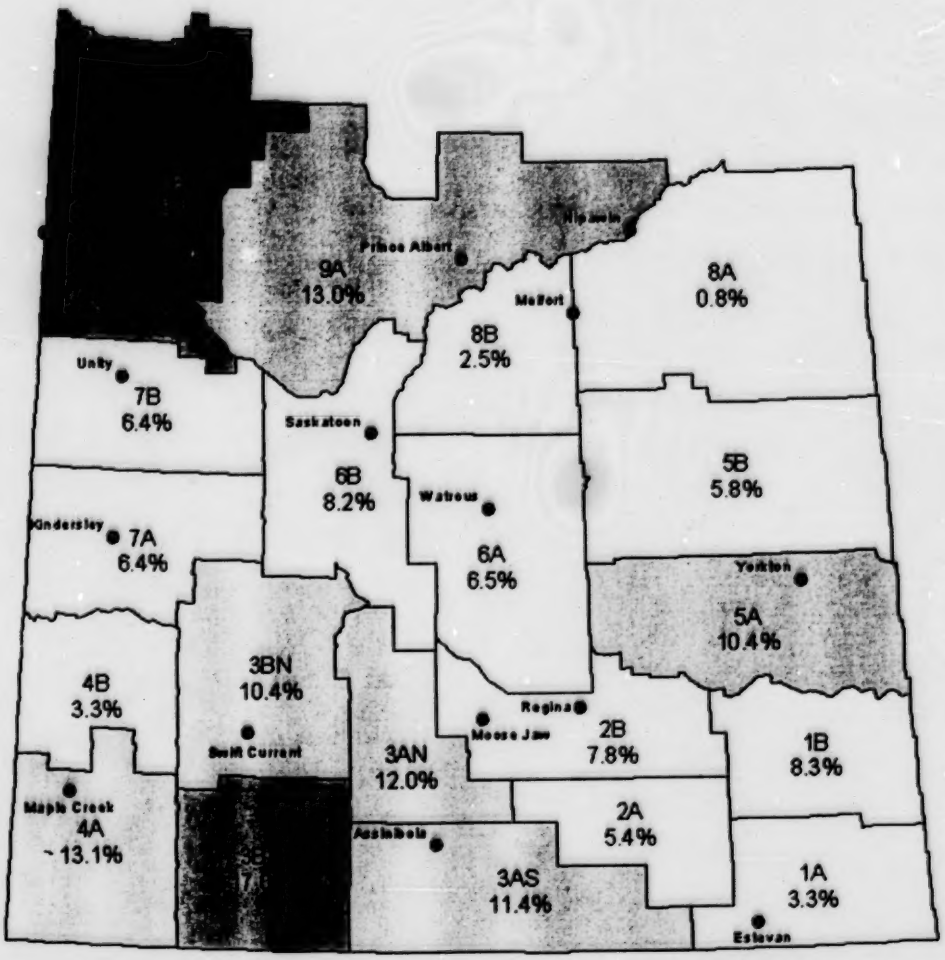
FIGURE 17:

Percent of Forage Land Affected by Ground Squirrels



Saskatchewan Agriculture and Food	Percent Affected: 25% - 30%; 20% - 25%; 15% - 20%; 10% - 15%; 5% - 10%; 0% - 5%	Prepared By:	Geomatics Unit, Statistics Branch
		Data source:	Survey Unit, Statistics Branch
		Date:	July 10, 2001

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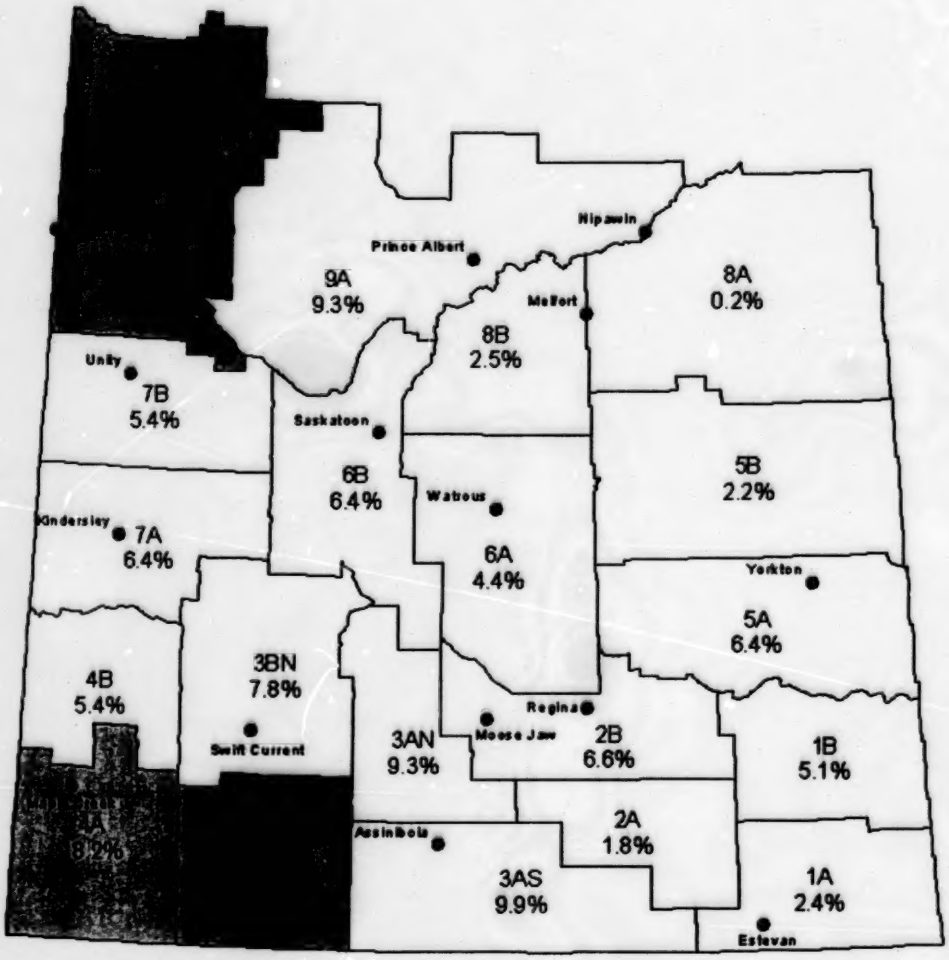
FIGURE 18:

Percent of Annual Crop Land Affected by Ground Squirrels



Saskatchewan Agriculture and Food	Percent Affected: 25% - 30%; 20% - 25%; 15% - 20%; 10% - 15%; 5% - 10%; 0% - 5%	Prepared By:	Geomatics Unit, Statistics Branch
		Data source:	Survey Unit, Statistics Branch
		Date:	July 10, 2001

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